EPA Comments on
Licensce Amendment Request for Homestake Mining Company Radon Background Relocation

For NESHAP compliance EPA has previously indicated COMPLY-R should be used for modeling of Radon gas. In this case the modeling is not directly for NESHAP at this time and was conducted in more of a relative sense. We have some concerns with the AERMOD modeling results, model inputs and the use of AERMOD for modeling impacts of Radon. These issues should be kept in mind when evaluating and weighing the modeling results that are from the ERG report. If any future modeling is done we recommend consulting with EPA on model selection and potentially developing a modeling protocol to minimize potential issues.

First, the AERMOD model is limited to modeling neutral or buoyant releases, and therefore is not capable of simulating the transport and dispersion of dense gases. However, the applicability of if AERMOD can/can't be used to model Radon depends upon the characteristics of the Radon gas emissions and the receptors of concern. In this case the modeling is centered around modeling non-buoyant fugitive releases that are not handled appropriately by AERMOD considering the greater density of Radon compared to fugitive species normally modeled. While Radon gas itself is heavier than air, it may quickly lose its negative buoyancy as it mixes with the ambient air and therefore act more like a neutrally-buoyant release under higher wind situations, but if the main concern is under lighter/calm conditions (as the ERG report indicates and we agree), AERMOD model projections would not be entirely accurate even if the emission estimates were accurate. We note that the modeling was conducted with AERMOD in parallel mode (MPI mode), which is an alteration to the EPA guideline approved version of AERMOD. We don't necessarily expect large differences due to the MPI version, but EPA Region 6 has not approved the use of parallel/MPI versions of AERMOD in regulatory required air quality analysis. In addition to meteorological factors that may influence the initial dilution of Radon, such as wind speed and atmospheric stability, turbulence generated by nearby structures may also mitigate the dense gas characteristics of a Radon plume and it was unclear that the storage pile had been included as a downwash structure. The report alludes that it was assumed that the terrain file included the elevation differences. This information should be confirmed and taken into consideration.

EPA's *Guideline on Air Quality Models* (Appendix W to 40 CFR Part 51) does not include any "preferred" dense gas dispersion models. However, a few "alternative" dense gas models are available on the SCRAM website, including ADAM, DEGADIS, and SLAB.

http://www.epa.gov/ttn/scram/dispersion_alt.htm

We also have a few documents on SCRAM related to toxics modeling that provide some guidance on modeling dense gas releases, in particular the "*Guidance on Hazardous/Toxic Air Releases*" document (http://www.epa.gov/ttn/scram/guidance_other.htm). However, we do not offer any support for application of these models.

If additional modeling were to be done, we would recommend potentially using one of these models capable of handling the dense gas characteristics if the main sources to be modeled are non-buoyant fugitive emissions.

We note that the emissions modeled for both the mine area sources and the Homestake facility are fairly high values and not well documented and not necessarily representative of the actual emissions. We understand that arbitrary emission levels were used both for Homestake facility and the mine area sources to evaluate what general concentration gradient contours would look like, but caution that these values not be taken in the absolute and the actual shape of the gradient contours would like differ somewhat if a more appropriate dense gas model were used. If additional modeling is done, we recommend trying to more accurately estimate emissions and appropriately characterizing the emission sources. The modeling in the report does provide some general value along with looking at terrain elevation maps and the spatial location of emission sources.

Conclusion and Recommendation

In looking at the data for the proposed background monitor (HMC-1Off) and the existing high monitor near the facility (HMC-4), these monitors are nearly identical, and the proposed background is even sometimes higher than HMC-4. We also note that there are large differences between monitored values between HMC-1Off, HMC-2Off and HMC-6Off, even though they all represent the same general upwind direction. Looking at the area and maps of potential sources, the terrain and channel flows, it appears some monitors are likely nearer to sources and in the direct drainage plumes, which may explain why the values are higher than monitors near the Homestake facility. We are very concerned and consider the reliance on one monitor (HMC-1Off) that is near the maximum values monitored near the facility is inappropriate and leads to an underestimation in contribution from Homestake's process and emissions sources.

Remodeling the local mines and other sources of Radon that impact the HMC-1Off through HMC-6Off monitors accurately with a dense gas model may be one way to help understand the local emissions, transport, and what the background value upwind of the facility when monitors HMC-4,5,&6 are high. This approach is difficult as appropriately estimating emissions of Radon from the mines, terrain flows and local meteorology all would lead to some uncertainties. While this is an option, we don't recommend this approach at this time.
Overall, the concentration gradients between the new monitoring data at monitors HMC-1Off, HMC-2Off, and HMC-6 Off vary greatly for monitors that are at most about 1.2 km apart and approximately 3 km from the Homestake facility. It is questionable that the emissions quantification and modeling of those emissions could accurately resolve the significant concentration gradient between these three monitors, which is why we are not recommending attempting to model at this time.

Another potential option would be to remodel the Homestake facility (emissions from processes and the storage pile with accurate emission estimates with a dense gas model. This may also be a way to help understand the local emissions, transport, and to back out what the background value upwind of the facility when monitors HMC-4,5,&6 are high. This approach is difficult as appropriately estimating emissions of Radon from the storage pile and other processes, terrain flows and fluctuations in background levels from different directions would lead to some uncertainties. Past evaluation of emission quantification tests on the storage pile also showed a large variability in emission, thus leading to uncertainty in the ability to accurately quantify the Homestake's facility impacts. While this is an option, we don't recommend this approach at this time.

Overall, we believe some averaging of background data from different wind directions may be the most appropriate at this time to represent the variation in background from different wind directions. We recognize that the concentration at monitor HMC-16 may be representative when winds are from the west-northwest and some other direction, but with winds from the north-northeast direction it may be underestimating impacts from radon sources. Since the monitoring data is for an extended period it is impossible to pick one wind direction as representative of the quarterly monitoring period. We would recommend some weighted gradient approach for the background monitor as a potential option. We recommend using the existing 2 years of data and the wind data from the same period to calculate a weighted gradient approach. For winds from the North to Northeast direction, HMC-1Off, HMC-6Off and HMC-2Off could be averaged; for winds from the WestNorthWest-NorthNorthwest, HMC-16 and HMC-5Off could be averaged; for Winds from the EastNortheast to East, HMC-3Off and HMC-4 Off could be averaged. If the winds that have fallen into these direction bins (West-NorthWest through East) were then used to weigh these directions and the associated background monitor average values, a value to use for all the close in monitors HMC-1 through HMC-7 could be developed. We note there is no background monitor data from the Southeast, South, Southwest or West of the Homestake facility therefore we propose using only the wind data that corresponds with the background monitoring data wind directions. Example: For all the winds from West-Northwest through East the percentages from the meteorological monitoring data are Winds from WNW-NNW 22% of winds, N-NE 50% of the winds, and ENE-E 28% of the winds. These percentages would then be multiplied by the average concentration value based on

the monitors discussed above to generate a composite value that would represent the background concentration for monitors HMC-1, 2, 3, 4, 5, 6, and 7).

We appreciate the opportunity to provide our input and insight into this situation. We would be happy to discuss any of these issues further to help clarify our concerns and potential remedies.